SECTION 16715

VEHICLE SIGNAL HEADS
(POLYCARBONATE)
(ADJUSTABLE, EXPANDABLE TYPE)

PART 1 GENERAL

1.01 SECTION INCLUDES

The purpose of this Specification is to describe the minimal requirements for traffic signal sections, assembled into three (3), four (4), and five (5) section heads installed on contract signal projects. Traffic signal section shall be polycarbonate and show glass lenses of the colors and configuration as shown on the drawings and in compliance with the arrangements allowed by the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

1.02 UNIT PRICES

A. Measurement
This Item will be measured by each vehicle signal head furnished complete in place. Heads shall consist of (3) three, (4) four, or (5) five sections of the LED color specified on the drawings, with the various lens combinations as required by the intersection layout or the standard details. When no color is specified, black shall be furnished. All vehicle signal heads shall have louvered backplates. Each louvered backplate furnished shall be measured as each unit furnished and installed, complete, in place as called for on the drawings. Each Pelco GPL louvre and adjustable full-circle visor shall be measured as each unit furnished and installed, complete, in place as called for on the drawings.

B. Payment
The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Vehicle Signal Head", of the various sizes, 3-section, 4-section, or 5-section with LED indications as specified on the layout or the standard drawings. All vehicle signal heads shall have louvered backplates. This price shall be full compensation for furnishing, assembling and installing the signal sections, LED indications, hangers and brackets, all mounting attachments; and for all labor, tools, equipment and incidentals necessary to complete work. Each louvered backplate furnished and installed as provided under "Measurement" will be paid for at the unit price bid for "Backplate," as specified on the layout or the standard drawings. This price shall be full compensation for furnishing and installing the louvred visor.

Each Pelco GPL louvre furnished and installed as provided under "Measurement" will be paid for at the unit price bid for "Pelco GPL Louvre," as specified on the layout or the standard drawings. This price shall be full compensation for furnishing and installing the full-circle adjustable visor and louvre.

PART 2 PRODUCTS

2.01 MATERIALS

A. The traffic control signal heads shall be in accordance with the latest revision of ITE Technical Report No. 1, except as noted below.

B. Each traffic signal face shall consist of a number of signal sections rigidly fastened together in such a manner as to present a continuous pleasing appearance.

C. The traffic signal head shall consist of a system of one or more signal sections with faces installed and illuminated in a definite sequence by a remote timing device, which shall indicate to traffic approaching the signal face the right-of-way at the intersection or giving warning of existence of a hazardous condition, thus facilitating an orderly movement of traffic through the intersection.

D. The electric and optical system of the signal head shall, unless otherwise specified, be designed for operation from a power supply of 115 volt, single phase, 60 Hz alternating current and LED displays.

E. Unless otherwise specified in the Plans, **POLYCARBONATE** shall be used in fabricating the traffic signal heads described herein. Structural requirements for polycarbonate materials are described in Paragraphs. 2.03 and 2.04

F. All material for the mounting attachments shall be metal.

2.02 STANDARD SIGNAL FACE AND HEADS

A. Signal face and signal section arrangement shall be as shown in the Plans.

B. The "Traffic Signal Head" shall consist of three or more lenses, each mounted in an individual housing case. The signal face shall be for vertical or horizontal installation and shall be so assembled that the red lens will be located at the top if vertically mounted and at the left if horizontally-mounted, the yellow lens at the center if vertically-mounted and to the right of the red

lens if horizontally-mounted, and the green lens at the bottom of the signal face if vertically-mounted three-section signal face, or to the right of the yellow lens if a horizontally-mounted three-section signal face. If more than three sections are required on a signal face, the lens shall be arranged as shown on the attached Plans; however, the arrangement shall not be in conflict with arrangements as shown in the latest revision of the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways."

C. Signal faces to be installed vertically or horizontally on mast arms shall be mounted by hardware as called for in the Plans. Any signal heads to be installed vertically or horizontally on the signal pole shall likewise be mounted by hardware as called for in the Plans.

D. Unless otherwise called for in the Plans, all supporting arm assemblies shall have threaded connections, not welded, and shall be assembled with full-threaded crosses, not elbows.

2.03 HOUSINGS

A. The polycarbonate traffic signal housing cases shall be a one-piece polycarbonate resin material with sides, top, and bottom integrally molded. The housing shall be injection molded from ultraviolet and heat stabilized flame retardant, permanently colored polycarbonate resins. The housing shall be a minimum of 0.125 inches (3.18 mm) thick measured anywhere on the housing, and shall be internally ribbed so as to produce the strongest possible assembly consistent with lightweight. The terminal block shall either be securely mounted or integrally molded into the housing.

B. Provision shall be made for accommodation of the particular type of mounting specified and attachment of doors, optical units, and other such accessories as may be specified for the particular installation. All traffic signal housing cases, together with doors, lenses, and mounting attachments, shall comprise a dust and moisture proof housing for the optical units, connecting wiring, and terminal block. The housing cases shall be of such construction as to assure permanent alignment of the lens in the traffic signal face. Design of door, housing, and visor shall be such that no light is visible in the profile view of the traffic signal face.

C. Traffic control signal housing cases shall be of the sectional, adjustable, expandable type. The assembled housings for each signal face shall consist of three or more individual dual sections, each designed for housing a single complete optical unit. Individual signal sections shall be rigidly attached to form a single head either with at least four machine screws between each section or by the bolt-and-washer conduit method. Complete signal heads

shall provide positive locked positioning when used with serrated brackets, mast arm, or span wire fittings.

D. Portions of cases providing for attachment to supporting arms shall be molded with large bosses for the supporting arms. Each housing case shall be so attached to its supporting arm that it will be adjustable by rotation about its vertical axis in such a manner that any pair of adjacent cases may be adjusted individually to give indications in two directions as close as 15 degrees apart and may be rigidly clamped in any position throughout the range of adjustment. Provision shall be made for carrying the traffic signal leads enclosed in the mounting attachment.

E. Both the top and bottom of each traffic signal housing case shall be provided with an opening of two inches (50 mm) in diameter to accommodate 1-1/2" (38 mm) pipe brackets. A locking ring shall be integrally cast or molded around the bottom opening. Around the top opening shall be either an integrally cast or molded locking ring or a separate splined locking ring designed to fit into notches. The locking rings shall have a minimum of 46 evenly spaced teeth and shall be so designed that the top and bottom rings will mate to provide a perfectly aligned signal head with flush connection between the outer circumference of the sections.

F. Any open end of an assembled beacon face housing shall be plugged with an ornamental cap and gasket of an approved type.

2.04 HOUSING DOOR

A. The housing door of each traffic signal housing shall be a one one-pieceycarbonate resin material with an approximate 12-inch (300 mm) diameter circular opening for the lens as specified. The housing door shall be a minimum of 0.125 inches (3.18mm) thick measured anywhere on the housing door. The door shall be attached to the housing by means of two stainless steel hinge pins.

B. Two stainless steel wing screws shall be installed on the side of the door to provide for opening and closing the door without the use of special tools. Wing screws shall have a flat-bearing surface or stainless steel flat washer to prevent gouging of the housing door by the wing screws. Wing screws shall remain captive in the housing door when the door is open.

2.05 VISORS

A. Each traffic signal housing door shall be equipped with an easily detachable standard tunnel visor (unless otherwise shown in the drawing layout). The visor shall be a polycarbonate resin to match the housing and door. The

visor shall be rigidly attached to the door with rust-resistant connections in a manner that will prevent the leakage of light and moisture throughout the periphery of attachment.

B. Unless otherwise called for in the Plans, the visor on the front of each door shall:

- Be circular in section
- Have a downward tilt of 2 to 8 degrees
- Encompass approximately 300 degrees of the lens
- Extend outward from the face of the lens a minimum of 9-1/2" (240 mm) for 12-inch (300 mm) diameter lens, (measured at its outer visible circumference)
- Be of such design that the encircled portion of the lens will not be visible in the profile view of the traffic signal face
- Be open at the bottom so as to prevent the accumulation of snow, dirt, and rain.

C. Visors shall be easily removed and replaced without damage to visor or signal head.

D. The four (4) tabs used to mount the visor to the signal shall be slotted. It shall not be necessary to completely remove the mounting screws to remove or replace the visor.

2.06 OPTICAL SYSTEM

A. Refer to Section 16T18, Vehicular LED indicators.

B. Reflector Ring. The reflector and the lamp receptacle shall be held in place in a molded polycarbonate ring by means of a special neoprene gasket.

2.07 TERMINAL BLOCKS

A. Each optical unit shall be wired to a two-post terminal block located in that signal section. Terminal blocks shall be furnished in the two outermost signal sections of any 3, 4, or 5 section head assembly. The Terminal blocks shall have a seven-post terminal block instead of the two-post unit described

above. All sections of the signal face assembly shall be wired to the seven-post terminal ready for field installation. All terminal blocks shall be securely mounted in an accessible position and shall be of weatherproof-molded construction, equipped with identified terminals. Binding screws shall be provided for the field and interior wires.

B. If specified, and/or shown in the Plans, a terminal compartment shall be provided for the side of pole-mounted signal heads in addition to the signal face assembly terminal block specified above. The terminal compartment shall be located as called for in the Plans.

The terminal compartment shall be equipped with a readily accessible moisture proof cover and weatherproof-molded construction connector block with identified terminals for signal and field wires. Separate terminals shall be provided for the interior wires and the field wires. In addition to the interior wires required above, the supplier is also required to furnish and install all other leads necessary to connect the terminal block of the multiple-section face to the terminal block in the terminal compartment. Each lead shall be brought to a separate terminal in the terminal compartment, except that the commons from one housing can all be brought to the same terminal in the terminal compartment. The color coding on leads from the individual optical units shall be maintained from the lamp holder to the individual terminals in the signal head terminal compartment, except that the commons from each housing shall be grouped and carried to one terminal. The wiring shall be so arranged that any one optical unit can be individually illuminated through connections to terminals in the terminal compartment.

The terminal block installed in the terminal compartment shall be equipped with pressure-type connectors having a minimum capacity of two (2) No. 12 AWG solid-copper conductors per connector and shall be provided with barriers and rated for 25 amperes, 250-volt service. This multiple-connector terminal block is to be equipped with a minimum of twelve (12) sets of connectors, with separate terminals for the interior and the fieldwire connections. Any variations from the above requirements will be covered in the Item description and drawings.

Use of terminal compartments containing terminal blocks does not eliminate the requirement for terminal blocks specified above.

2.08 MOUNTING ATTACHMENTS

A. All mounting attachments shall be metal as specified in the Traffic Signal Details (02893 Series). Provision shall be made for carrying the signal leads enclosed in the mounting attachment. The mounting attachment, together with supporting arms and assembled housings, shall comprise a dust-and-

moisture-proof enclosure for optical units and lead wiring. Mounting attachments shall be of one of the following types as specified for the particular head on the Item Description and attached Drawings.

1. Span-Wire Mounting. The span-wire mounting attachment shall consist of a cable clamp to receive a suspension cable of 3/8" (10 mm) diameter together with a suitable connection to the signal head. The mounting shall provide a "balance adjuster" between the signal head and span wire capable of permitting freedom of movement with reference to the point of suspension. The signal head shall be adjustable by rotation about its vertical axis in a horizontal plane and the mounting attachment shall be so constructed that the head may be firmly clamped in any position throughout the range of adjustment. The mounting shall provide a suitable outlet for wiring from the signal head tilted downward and so constructed as to effectively seal the interior of the head from dust and moisture and prevent undue abrasion of signal wiring. Mountings for signal head units not balanced at the point of support shall be provided with a suitable compensating device to insure that the signal head will assume a normally vertical position.

2. Mast-Arm Mounting. The mast-arm signal head mounting shall be as shown in the Traffic Signal Details (02893 Series).

3. Side-of-Pole Mounting. Supports for side-of-pole mounting of the signal head in a vertical position shall be 1-1/2" (38 mm) (nominal diameter) standard pipe bracket arms, attached to the top and bottom of the signal head. The signal head shall be adjustable, by rotation of the various signal faces about their vertical axis, throughout a radial angle of 360 degrees and shall be capable of being rigidly clamped in any position through the range of adjustment. The mounting assembly shall consist of two standard pipe sections extending 12-3/4" from and at right angles to the axis of rotational adjustment of the signal head. Both supports shall have running threads at least 1-1/4" long at the pole connection end. Provision shall be made for carrying the wiring from the signal head enclosed in the bottom support and an outlet tilted downward for the wiring shall be provided, adjacent to the pole connection end, tapped and plugged for 1-1/4" conduit. Any variations to this design are shown in the drawings.

4. Top-of-Post Mounting. Supports for top-of-post mounting of the signal head in a vertical position shall be 1-1/2" (38mm) (nominal diameter) standard pipe bracket arms attached to the top and bottom of the signal head. The mounting assembly shall consist of a slip fitter connection, as either the hub or as a part of the hub of the bottom pipe-arm assembly, for attachment around the top of a 4-1/2" (115 mm) outside-diameter pipe.

The signal head shall be adjustable, by rotation about its vertical axis in a horizontal plane, throughout a radial angle of 360 degrees and the mounting attachment shall be so constructed that the head may be firmly clamped in any position throughout the range of adjustment. The slip fitter connection shall be of pleasing appearance and of adequate strength, capable of holding the signal head rigidly in place and effectively sealing the interior of the pipe from moisture.

2.09 PAINT AND PAINTING

C. Material & Colors (polycarbonate Signal Faces and/or Signal Heads Only). All material used in construction of major traffic signal components shall be polycarbonate resin. This material shall withstand 70 foot-pounds (95 Joules) of impact without fracture or permanent deformation. Material for hardware shall be cast aluminum of adequate strength for the intended purpose.

2.10 LOUVERED TRAFFIC SIGNAL CONTROL BACK PLATE

A. The back plate shall be attached to all new vehicle signals. Back plate shall be continuously louvered around its perimeter.

B. Back plates shall be aluminum and shall be a minimum thickness of 0.050. Back plates shall be made of the same material as the signal housing. The back plate shall extend around the periphery of the signal face a distance of five (5) inches for faces with twelve (12) inch lenses.

C. D.Louvres – Pelco GPL louvres shall be furnished, as called for on the plans. When required, the louvres shall be installed in special Pelco adjustable, full-circle visors.

D. After the louvering process, back plates shall be painted flat black on all surfaces.

2.11 UPPER AND LOWER ARMS FOR MAST ARM MOUNT SIGNAL BRACKET

A. Upper and Lower Arms: Shall be cast from 319 aluminum or equivalent. The lower bracket arm shall be internally threaded to accommodate a 1 1/2" - 11 1/2" NPS threaded vertical support tube. The lower arm shall be furnished with an ABS plastic cover, which will slide and snap into position without the use of fasteners or tools. Both upper and lower arms shall have a tri-bolt arrangement for attachment to the signal housing. Opening in the lower arm shall accommodate a minimum of three (3) conductor 14-gauge cables. See Traffic Signal Details Sheet 12, Type II mount detail.

B. Finish:

1. All aluminum parts shall have an Alodine 1200 (or equivalent) finish.

2. All steel parts shall have yellow zinc di-chromate finish.

C. Hardware: Each Arm Kit shall be complete with all necessary bolts, washers, gaskets, etc. to allow assembly of the signal to the bracket arms.

D. Packaging:

1. A pair of Bracket Arms (1 upper & 1 lower) shall be sealed in a plastic bag complete with four (4) setscrews for attaching arms to a support tube and all necessary hardware for attaching arms to a signal section.

2. Four (4) Arm Kits (D1 above) shall be provided in an individual carton constituting a master kit.

2.12 VERTICAL SUPPORT TUBE FOR MAST ARM MOUNT SIGNAL BRACKET

A. Vertical Support Tube: Shall be a double gusseted tube extruded from 6063-T6 aluminum alloy and have a cross section as shown in Fig. 3. Each tube shall be complete with a Vinyl Closure Strip 2" less than the tube length and be threaded on one end with 1 1/2" - 11 1/2" NPS threads for a length of 1 1/2". Tubes shall be provided in lengths as specified on the bid request.

B. Finish: All aluminum parts shall have an Alodine 1200 (or equivalent) finish.

C. Packaging: Four (4) tubes and vinyl closures shall be provided in an individual carton constituting a master kit.

END OF SECTION

SECTION 16715

VEHICLE SIGNAL HEADS
(POLYCARBONATE)
(ADJUSTABLE, EXPANDABLE TYPE)

PART 1 GENERAL

1.01 SECTION INCLUDES

The purpose of this Specification is to describe the minimal requirements for traffic signal sections, assembled into three (3), four (4), and five (5) section heads installed on contract signal projects. Traffic signal section shall be polycarbonate and show glass lenses of the colors and configuration as shown on the drawings and in compliance with the arrangements allowed by the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

1.02 UNIT PRICES

A. Measurement
This Item will be measured by each vehicle signal head furnished complete in place. Heads shall consist of (3) three, (4) four, or (5) five sections of the LED color specified on the drawings, with the various lens combinations as required by the intersection layout or the standard details. When no color is specified, black shall be furnished. All vehicle signal heads shall have louvered backplates. Each louvered backplate furnished shall be measured as each unit furnished and installed, complete, in place as called for on the drawings. Each Pelco GPL louvre and adjustable full-circle visor shall be measured as each unit furnished and installed, complete, in place as called for on the drawings.

B. Payment
The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Vehicle Signal Head", of the various sizes, 3-section, 4-section, or 5-section with LED indications as specified on the layout or the standard drawings. All vehicle signal heads shall have louvered backplates. This price shall be full compensation for furnishing, assembling and installing the signal sections, LED indications, hangers and brackets, all mounting attachments; and for all labor, tools, equipment and incidentals necessary to complete work. Each louvered backplate furnished and installed as provided under "Measurement" will be paid for at the unit price bid for "Backplate," as specified on the layout or the standard drawings. This price shall be full compensation for furnishing and installing the louvred visor.

Each Pelco GPL louvre furnished and installed as provided under "Measurement" will be paid for at the unit price bid for "Pelco GPL Louvre," as specified on the layout or the standard drawings. This price shall be full compensation for furnishing and installing the full-circle adjustable visor and louvre.

PART 2 PRODUCTS

2.01 MATERIALS

A. The traffic control signal heads shall be in accordance with the latest revision of ITE Technical Report No. 1, except as noted below.

B. Each traffic signal face shall consist of a number of signal sections rigidly fastened together in such a manner as to present a continuous pleasing appearance.

C. The traffic signal head shall consist of a system of one or more signal sections with faces installed and illuminated in a definite sequence by a remote timing device, which shall indicate to traffic approaching the signal face the right-of-way at the intersection or giving warning of existence of a hazardous condition, thus facilitating an orderly movement of traffic through the intersection.

D. The electric and optical system of the signal head shall, unless otherwise specified, be designed for operation from a power supply of 115 volt, single phase, 60 Hz alternating current and LED displays.

E. Unless otherwise specified in the Plans, **POLYCARBONATE** shall be used in fabricating the traffic signal heads described herein. Structural requirements for polycarbonate materials are described in Paragraphs. 2.03 and 2.04

F. All material for the mounting attachments shall be metal.

2.02 STANDARD SIGNAL FACE AND HEADS

A. Signal face and signal section arrangement shall be as shown in the Plans.

B. The "Traffic Signal Head" shall consist of three or more lenses, each mounted in an individual housing case. The signal face shall be for vertical or horizontal installation and shall be so assembled that the red lens will be located at the top if vertically mounted and at the left if horizontally-mounted, the yellow lens at the center if vertically-mounted and to the right of the red

lens if horizontally-mounted, and the green lens at the bottom of the signal face if vertically-mounted three-section signal face, or to the right of the yellow lens if a horizontally-mounted three-section signal face. If more than three sections are required on a signal face, the lens shall be arranged as shown on the attached Plans; however, the arrangement shall not be in conflict with arrangements as shown in the latest revision of the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways."

C. Signal faces to be installed vertically or horizontally on mast arms shall be mounted by hardware as called for in the Plans. Any signal heads to be installed vertically or horizontally on the signal pole shall likewise be mounted by hardware as called for in the Plans.

D. Unless otherwise called for in the Plans, all supporting arm assemblies shall have threaded connections, not welded, and shall be assembled with full-threaded crosses, not elbows.

2.03 HOUSINGS

A. The polycarbonate traffic signal housing cases shall be a one-piece polycarbonate resin material with sides, top, and bottom integrally molded. The housing shall be injection molded from ultraviolet and heat stabilized flame retardant, permanently colored polycarbonate resins. The housing shall be a minimum of 0.125 inches (3.18 mm) thick measured anywhere on the housing, and shall be internally ribbed so as to produce the strongest possible assembly consistent with lightweight. The terminal block shall either be securely mounted or integrally molded into the housing.

B. Provision shall be made for accommodation of the particular type of mounting specified and attachment of doors, optical units, and other such accessories as may be specified for the particular installation. All traffic signal housing cases, together with doors, lenses, and mounting attachments, shall comprise a dust and moisture proof housing for the optical units, connecting wiring, and terminal block. The housing cases shall be of such construction as to assure permanent alignment of the lens in the traffic signal face. Design of door, housing, and visor shall be such that no light is visible in the profile view of the traffic signal face.

C. Traffic control signal housing cases shall be of the sectional, adjustable, expandable type. The assembled housings for each signal face shall consist of three or more individual dual sections, each designed for housing a single complete optical unit. Individual signal sections shall be rigidly attached to form a single head either with at least four machine screws between each section or by the bolt-and-washer conduit method. Complete signal heads

shall provide positive locked positioning when used with serrated brackets, mast arm, or span wire fittings.

D. Portions of cases providing for attachment to supporting arms shall be molded with large bosses for the supporting arms. Each housing case shall be so attached to its supporting arm that it will be adjustable by rotation about its vertical axis in such a manner that any pair of adjacent cases may be adjusted individually to give indications in two directions as close as 15 degrees apart and may be rigidly clamped in any position throughout the range of adjustment. Provision shall be made for carrying the traffic signal leads enclosed in the mounting attachment.

E. Both the top and bottom of each traffic signal housing case shall be provided with an opening of two inches (50 mm) in diameter to accommodate 1-1/2" (38 mm) pipe brackets. A locking ring shall be integrally cast or molded around the bottom opening. Around the top opening shall be either an integrally cast or molded locking ring or a separate splined locking ring designed to fit into notches. The locking rings shall have a minimum of 46 evenly spaced teeth and shall be so designed that the top and bottom rings will mate to provide a perfectly aligned signal head with flush connection between the outer circumference of the sections.

F. Any open end of an assembled beacon face housing shall be plugged with an ornamental cap and gasket of an approved type.

2.04 HOUSING DOOR

A. The housing door of each traffic signal housing shall be a one one-pieceycarbonate resin material with an approximate 12-inch (300 mm) diameter circular opening for the lens as specified. The housing door shall be a minimum of 0.125 inches (3.18mm) thick measured anywhere on the housing door. The door shall be attached to the housing by means of two stainless steel hinge pins.

B. Two stainless steel wing screws shall be installed on the side of the door to provide for opening and closing the door without the use of special tools. Wing screws shall have a flat-bearing surface or stainless steel flat washer to prevent gouging of the housing door by the wing screws. Wing screws shall remain captive in the housing door when the door is open.

2.05 VISORS

A. Each traffic signal housing door shall be equipped with an easily detachable standard tunnel visor (unless otherwise shown in the drawing layout). The visor shall be a polycarbonate resin to match the housing and door. The

visor shall be rigidly attached to the door with rust-resistant connections in a manner that will prevent the leakage of light and moisture throughout the periphery of attachment.

B. Unless otherwise called for in the Plans, the visor on the front of each door shall:

- Be circular in section
- Have a downward tilt of 2 to 8 degrees
- Encompass approximately 300 degrees of the lens
- Extend outward from the face of the lens a minimum of 9-1/2" (240 mm) for 12-inch (300 mm) diameter lens, (measured at its outer visible circumference)
- Be of such design that the encircled portion of the lens will not be visible in the profile view of the traffic signal face
- Be open at the bottom so as to prevent the accumulation of snow, dirt, and rain.

C. Visors shall be easily removed and replaced without damage to visor or signal head.

D. The four (4) tabs used to mount the visor to the signal shall be slotted. It shall not be necessary to completely remove the mounting screws to remove or replace the visor.

2.06 OPTICAL SYSTEM

A. Refer to Section 16T18, Vehicular LED indicators.

B. Reflector Ring. The reflector and the lamp receptacle shall be held in place in a molded polycarbonate ring by means of a special neoprene gasket.

2.07 TERMINAL BLOCKS

A. Each optical unit shall be wired to a two-post terminal block located in that signal section. Terminal blocks shall be furnished in the two outermost signal sections of any 3, 4, or 5 section head assembly. The Terminal blocks shall have a seven-post terminal block instead of the two-post unit described

above. All sections of the signal face assembly shall be wired to the seven-post terminal ready for field installation. All terminal blocks shall be securely mounted in an accessible position and shall be of weatherproof-molded construction, equipped with identified terminals. Binding screws shall be provided for the field and interior wires.

B. If specified, and/or shown in the Plans, a terminal compartment shall be provided for the side of pole-mounted signal heads in addition to the signal face assembly terminal block specified above. The terminal compartment shall be located as called for in the Plans.

The terminal compartment shall be equipped with a readily accessible moisture proof cover and weatherproof-molded construction connector block with identified terminals for signal and field wires. Separate terminals shall be provided for the interior wires and the field wires. In addition to the interior wires required above, the supplier is also required to furnish and install all other leads necessary to connect the terminal block of the multiple-section face to the terminal block in the terminal compartment. Each lead shall be brought to a separate terminal in the terminal compartment, except that the commons from one housing can all be brought to the same terminal in the terminal compartment. The color coding on leads from the individual optical units shall be maintained from the lamp holder to the individual terminals in the signal head terminal compartment, except that the commons from each housing shall be grouped and carried to one terminal. The wiring shall be so arranged that any one optical unit can be individually illuminated through connections to terminals in the terminal compartment.

The terminal block installed in the terminal compartment shall be equipped with pressure-type connectors having a minimum capacity of two (2) No. 12 AWG solid-copper conductors per connector and shall be provided with barriers and rated for 25 amperes, 250-volt service. This multiple-connector terminal block is to be equipped with a minimum of twelve (12) sets of connectors, with separate terminals for the interior and the fieldwire connections. Any variations from the above requirements will be covered in the Item description and drawings.

Use of terminal compartments containing terminal blocks does not eliminate the requirement for terminal blocks specified above.

2.08 MOUNTING ATTACHMENTS

A. All mounting attachments shall be metal as specified in the Traffic Signal Details (02893 Series). Provision shall be made for carrying the signal leads enclosed in the mounting attachment. The mounting attachment, together with supporting arms and assembled housings, shall comprise a dust-and-

moisture-proof enclosure for optical units and lead wiring. Mounting attachments shall be of one of the following types as specified for the particular head on the Item Description and attached Drawings.

1. Span-Wire Mounting. The span-wire mounting attachment shall consist of a cable clamp to receive a suspension cable of 3/8" (10 mm) diameter together with a suitable connection to the signal head. The mounting shall provide a "balance adjuster" between the signal head and span wire capable of permitting freedom of movement with reference to the point of suspension. The signal head shall be adjustable by rotation about its vertical axis in a horizontal plane and the mounting attachment shall be so constructed that the head may be firmly clamped in any position throughout the range of adjustment. The mounting shall provide a suitable outlet for wiring from the signal head tilted downward and so constructed as to effectively seal the interior of the head from dust and moisture and prevent undue abrasion of signal wiring. Mountings for signal head units not balanced at the point of support shall be provided with a suitable compensating device to insure that the signal head will assume a normally vertical position.

2. Mast-Arm Mounting. The mast-arm signal head mounting shall be as shown in the Traffic Signal Details (02893 Series).

3. Side-of-Pole Mounting. Supports for side-of-pole mounting of the signal head in a vertical position shall be 1-1/2" (38 mm) (nominal diameter) standard pipe bracket arms, attached to the top and bottom of the signal head. The signal head shall be adjustable, by rotation of the various signal faces about their vertical axis, throughout a radial angle of 360 degrees and shall be capable of being rigidly clamped in any position through the range of adjustment. The mounting assembly shall consist of two standard pipe sections extending 12-3/4" from and at right angles to the axis of rotational adjustment of the signal head. Both supports shall have running threads at least 1-1/4" long at the pole connection end. Provision shall be made for carrying the wiring from the signal head enclosed in the bottom support and an outlet tilted downward for the wiring shall be provided, adjacent to the pole connection end, tapped and plugged for 1-1/4" conduit. Any variations to this design are shown in the drawings.

4. Top-of-Post Mounting. Supports for top-of-post mounting of the signal head in a vertical position shall be 1-1/2" (38mm) (nominal diameter) standard pipe bracket arms attached to the top and bottom of the signal head. The mounting assembly shall consist of a slip fitter connection, as either the hub or as a part of the hub of the bottom pipe-arm assembly, for attachment around the top of a 4-1/2" (115 mm) outside-diameter pipe.

The signal head shall be adjustable, by rotation about its vertical axis in a horizontal plane, throughout a radial angle of 360 degrees and the mounting attachment shall be so constructed that the head may be firmly clamped in any position throughout the range of adjustment. The slip fitter connection shall be of pleasing appearance and of adequate strength, capable of holding the signal head rigidly in place and effectively sealing the interior of the pipe from moisture.

2.09 PAINT AND PAINTING

C. Material & Colors (polycarbonate Signal Faces and/or Signal Heads Only). All material used in construction of major traffic signal components shall be polycarbonate resin. This material shall withstand 70 foot-pounds (95 Joules) of impact without fracture or permanent deformation. Material for hardware shall be cast aluminum of adequate strength for the intended purpose.

2.10 LOUVERED TRAFFIC SIGNAL CONTROL BACK PLATE

A. The back plate shall be attached to all new vehicle signals. Back plate shall be continuously louvered around its perimeter.

B. Back plates shall be aluminum and shall be a minimum thickness of 0.050. Back plates shall be made of the same material as the signal housing. The back plate shall extend around the periphery of the signal face a distance of five (5) inches for faces with twelve (12) inch lenses.

C. D.Louvres – Pelco GPL louvres shall be furnished, as called for on the plans. When required, the louvres shall be installed in special Pelco adjustable, full-circle visors.

D. After the louvering process, back plates shall be painted flat black on all surfaces.

2.11 UPPER AND LOWER ARMS FOR MAST ARM MOUNT SIGNAL BRACKET

A. Upper and Lower Arms: Shall be cast from 319 aluminum or equivalent. The lower bracket arm shall be internally threaded to accommodate a 1 1/2" - 11 1/2" NPS threaded vertical support tube. The lower arm shall be furnished with an ABS plastic cover, which will slide and snap into position without the use of fasteners or tools. Both upper and lower arms shall have a tri-bolt arrangement for attachment to the signal housing. Opening in the lower arm shall accommodate a minimum of three (3) conductor 14-gauge cables. See Traffic Signal Details Sheet 12, Type II mount detail.

B. Finish:

1. All aluminum parts shall have an Alodine 1200 (or equivalent) finish.

2. All steel parts shall have yellow zinc di-chromate finish.

C. Hardware: Each Arm Kit shall be complete with all necessary bolts, washers, gaskets, etc. to allow assembly of the signal to the bracket arms.

D. Packaging:

1. A pair of Bracket Arms (1 upper & 1 lower) shall be sealed in a plastic bag complete with four (4) setscrews for attaching arms to a support tube and all necessary hardware for attaching arms to a signal section.

2. Four (4) Arm Kits (D1 above) shall be provided in an individual carton constituting a master kit.

2.12 VERTICAL SUPPORT TUBE FOR MAST ARM MOUNT SIGNAL BRACKET

A. Vertical Support Tube: Shall be a double gusseted tube extruded from 6063-T6 aluminum alloy and have a cross section as shown in Fig. 3. Each tube shall be complete with a Vinyl Closure Strip 2" less than the tube length and be threaded on one end with 1 1/2" - 11 1/2" NPS threads for a length of 1 1/2". Tubes shall be provided in lengths as specified on the bid request.

B. Finish: All aluminum parts shall have an Alodine 1200 (or equivalent) finish.

C. Packaging: Four (4) tubes and vinyl closures shall be provided in an individual carton constituting a master kit.

END OF SECTION